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AUTHOR DiMatties, Marie E.; Sammons, Jennifer H.
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ABSTRACT

This brief paper summarizes what is known about sensory integration and sensory integration dysfunction (DSI). It outlines evaluation of DSI, treatment approaches, and implications for parents and teachers, including compensatory strategies for minimizing the impact of DSI on a child's life. Review of origins of sensory integration theory in the work of A. Jean Ayres more than 20 years ago is followed by consideration of characteristics of sensory integration dysfunction, defined as the "inability to modulate, discriminate, coordinate or organize sensation adaptively." It then addresses methods for identifying DSI including skilled observation of the child, parent/caregiver sensory questionnaires or checklists, and standardized tests of general development and motor functioning. Interventions based on sensory integration theory are explained and include therapist consultation, a sensory diet of specific sensory activities, a comprehensive approach to treating sensory defensiveness, and the "How Does Your Engine Run?" program, a step-by-step method that teaches children simple changes to their daily routine to help them self-regulate. The paper concludes that collaboration among the therapist, teacher, and parent is most effective. (Contains 10 references.) (DB)

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**By
Marie E. DiMatties
Jennifer H. Sammons**

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Understanding Sensory Integration

Marie E. DiMatties and Jennifer H. Sammons

Michael is a third grade student who is waiting for the school bus. He is challenged by sensory experiences during everyday activities that most of us don't even think about. While he's still reeling from the battle with mom over brushing his teeth (that peppermint toothpaste tastes like fire in his mouth) the school bus pulls up. Michael runs past the bus monitor's haze of perfume and sits at the back of the bus. In his heightened state, he becomes even more aware of his new school shirt with its stiff label and that awful feeling like a wire brush being poked into the back of his neck. The sensory experiences of the movement of the bus, the sound of his excited classmates laughing and yelling above the roar of the bus engine all contribute to his increased agitation. By the time Michael arrives at school he is wound up and ready to unravel. There is no time to wait for the bus monitor's direction...getting off the bus quickly becomes a matter of survival and he resorts to pushing, shoving and finally kicking his way out. Unfortunately, there is a price to pay for this seemingly outward aggression...he can expect another trip to the principal's office.

This digest defines sensory integration and sensory integration dysfunction (DSI). It outlines evaluation of DSI, treatment approaches and implications for parents and teachers, including compensatory strategies for minimizing the impact of DSI on a child's life.

What is Sensory Integration?

Sensory Integration is a theory developed over more than 20 years by A. Jean Ayres, an occupational therapist with advanced training in neuroscience and educational psychology (Bundy & Murray, 2002). Ayres (1972) defines sensory integration as "the neurological process that organizes sensation from one's own body and from the environment and makes it possible to use the body effectively within the environment" (p. 11). The theory is used to explain the relationship between the brain and behavior and explains why individuals respond in a certain way to sensory input and how it affects behavior. The five main senses are:

- Touch - tactile
- Sound - auditory
- Sight - visual
- Taste - gustatory
- Smell - olfactory

In addition, there are two other powerful senses:

- a) vestibular (movement and balance sense) - provides information about where the head and body are in space and in relation to the earth's surface.
- b) proprioception (joint/muscle sense) - provides information about where body parts are and what they are doing.

What is Sensory Integration Dysfunction (DSI)?

Dysfunction in sensory integration is the "inability to modulate, discriminate, coordinate or organize sensation adaptively" (Lane et al., 2000, p. 2).

How efficiently we process sensory information affects our ability to:

- a) **discriminate sensory information** to obtain precise information from the body and the environment in order to physically interact with people and objects. An accurate body scheme is necessary for motor planning, i.e., being able to plan unfamiliar movements. It involves having the idea of what to do, sequencing the required movements, and executing the movements in a well-timed, coordinated manner.

Michael frequently bumps into others and drops items on the way to class because of his poor body scheme. He often hands in crumpled assignments that reflect the challenges of holding a pencil in his hand and making precise movements to achieve legible handwriting. Concentrating on his school work intensely may lead him to fall off his chair. To most people, Michael appears to be a sloppy, clumsy, and forgetful child.

In gym class, Michael cannot master jumping jacks, somersaults make him feel sick, and he has given up on ever being able to connect with a baseball. His timing was always off. He resorts to being the class clown to cover up for his difficulties. Michael certainly doesn't feel good about himself. He can't do what other kids seem to do so effortlessly—and then there is the teasing...

- b) **modulate sensory information** to adjust to the circumstances and maintain optimum arousal for the task at hand. Sensory modulation is the "capacity to regulate and organize the degree, intensity and nature of responses to sensory input in a graded and adaptive manner" (Miller & Lane, 2000).

Sensory defensiveness, a type of sensory modulation problem, is defined by Wilbarger and Wilbarger (1991) as "a constellation of symptoms related to aversive or defensive reactions to non-noxious stimuli across one or more sensory systems" (Wilbarger & Wilbarger, 2002a, p. 335). It can affect changes in the state of alertness, emotional tone, and stress (Wilbarger & Wilbarger, 2002a).

Michael demonstrates many symptoms of sensory defensiveness, which affect his attention, learning, and behavior. His teacher's instructions get lost in competition with a clock ticking, the echo of peers walking and talking in the hall. He is off task and he finds solace in humming or chewing on the end of his pencil, sensory seeking behaviors that help ease the discomfort. Fortunately, he has gym class before lunch. Running

bases in gym class gives him a legitimate opportunity for the "heavy work" that his body needs. It sure makes him feel better and prepares him for the biggest challenge of all—eating lunch in the school cafeteria

How is DSI Identified?

DSI is identified through evaluation by an occupational therapist who has advanced training in sensory integration, using one or more of the following practices:

- Gathering information about the child's performance in daily life tasks within the context of the classroom, school, and/or home environment.
- Skilled observation of the child: the therapist sets up a play environment and observes the child's responses to different types of sensory input and motor planning ability.
- Parent/caregiver sensory questionnaires /standardized checklists, e.g., Sensory Profile (Dunn, 1999), non-standardized checklists.
- Parent/caregiver interview: the therapist identifies specific functional problems related to problems with sensory processing.
- Standardized tests of general development and motor functioning, e.g., Sensory Integration and Praxis Test Battery (SIPT) (Ayres, 1989).
- Clinical observations of posture, coordination, etc.

Intervention for DSI

Fostering the child's participation in normal everyday childhood activities or "occupations" is the main goal of occupational therapy. Intervention starts when teachers and parents are taught about DSI and intervention so they can develop strategies that help with adaptation or compensation for dysfunction (Bundy & Koomar, 2002). Based on information gathered, the therapist collaborates with teachers and parents to design an intervention plan to address the child's sensory integration problems.

Interventions Based on Sensory Integration Theory

Therapist consultation aims to educate teachers, parents, and older children about sensory integration and to develop strategies to adapt to and compensate for dysfunction such as:

- environmental modifications
- adaptations to daily routines
- changes in how people interact with the child (Wilbarger & Wilbarger, 2002)

Examples are reducing distracting visual materials in the classroom, giving the child an alternative to a messy art activity, or refraining from wearing perfume or bright, floral clothing.

A **sensory diet** is a strategy that consists of a carefully planned practical program of specific sensory activities that is scheduled according to each child's individual needs. Like a diet designed to meet an individual's nutritional needs, a sensory diet consists of specific elements designed to meet the child's sensory integration needs. The sensory diet is based on the notion that controlled sensory input can affect one's functional abilities (Wilbarger & Wilbarger, 2002b). A sensory diet can help maintain an age appropriate level of attention for optimal function to reduce sensory defensiveness.

Wilbarger & Wilbarger's (200b) **comprehensive approach** to treating sensory defensiveness includes education and awareness, a sensory

diet, and other professional treatment techniques. One such technique is the Wilbarger Protocol, which uses deep pressure to certain parts of the body followed by proprioception in the form of joint compressions. It is critical that this protocol is not used in isolation and that it is initiated and monitored by an appropriately trained therapist.

The "How Does Your Engine Run?" Program (Williams & Shellenberger, 1994) is a step-by-step method that teaches children simple changes to their daily routine (such as a brisk walk, jumping on a trampoline prior to doing their homework, listening to calming music) that will help them self-regulate or keep their engine running "just right." Through the use of charts, worksheets, and activities, the child is guided in improving awareness and using self-regulation strategies.

Traditional Sensory Integrative Therapy

Traditional sensory integrative therapy takes place on a 1:1 basis in a room with suspended equipment for varying movement and sensory experiences. The goal of therapy is not to teach skills, but to follow the child's lead and artfully select and modify activities according to the child's responses. The activities afford a variety of opportunities to experience tactile, vestibular, and proprioceptive input in a way that provides the "just right" challenge for the child to promote increasingly more complex adaptive responses to environmental challenges. The result is improved performance of skills that relate to life roles, e.g., player, student, (Schaaf & Anzalone, 2001). This type of intervention may be used along with other treatment approaches.

Summary

DSI can have a profound effect on a child's participation in everyday childhood "occupations," including play, study and family activities. Collaboration between the therapist, teacher, and parent is the most efficient way to understand the child's behavior and unique sensory needs. Together, they can implement strategies to support the child's performance in roles and occupations across multiple environments.

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